NOW IS THE TIME...FOR

making those much needed replacements of worn parts of your equipment by buying

REPAIR PARTS

Prices of most repair parts are now lower than they have been for years. Equipment placed in first class condition now will be ready to operate at full capacity when consumers begin to buy your products.

Low costs will be necessary to make resumption profitable—low costs depend largely upon efficient equipment in best possible working order.

And ***remember,*** when you buy repair parts, that the manufacturer of the machine for which they are intended has gained experience with many similar machines in other plants—that he is constantly making improvements in those parts based on this experience—that his shop is equipped with tools specifically for the manufacture of such parts—and that many of the parts are patented.

So that it would pay to buy from the machine manufacturer, who is interested in supplying parts that will assist in obtaining the highest efficiency from the machine itself.

F. L. SMIDTH & CO.

Engineers

225 Broadway **New York, N. Y.**

Designers and Equippers of Cement Making Factories

This advertiser is showing his readiness to serve you as business improves

CEMENT MILL SECTION of

Concrete

The Cement Mill Edition of Concrete is edited exclusively for those interested in the manufacture of portland cement. Its pages are devoted to discussions of plant design, management, operation, production efficiency, chemical research and control, quarry operation, progress and news of the industry.

The Cement Mill Edition also contains all the material published in the corresponding Regular Edition and so provides news of the uses and merchandising of the materials whose manufacture is discussed in the Mill Edition. The Regular Section furnishes mill operating officials and mill executives valuable points of contact with the users of the materials they produce.

Volume 40 June, 1932 Number 6

CONTENTS

◆

Sintering Grate and Rotary Kiln Gain Fuel Economy *(Illus.)* 45
T. H. Arnold, in final article, discusses economic aspects of process; makes comparison of six modern burning methods.

Low Installation and Operating Costs Features of Dust Collector *(Illus.)* 51
Description of Illinois installation, together with preliminary experiments, operation, and costs.

Editorial 54
Manitowoc's Predicament.
A Threat and an Opportunity.

Electric Dewatering of Slurry Under Four-Year Test *(Illus.)* 55
Hewitt Wilson and H. G. Wilcox, in concluding installment, describe tests with continuous electrophoresis machine; show electric power requirements.

Cement Statistics for April *(Illus.)* 59
U. S. Bureau of Mines monthly report.

Men and Mills *(Illus.)* 60
News of the month.

With the Manufacturers 62

Copyright, 1932, by Concrete Publishing Co.

INDEX TO ADVERTISEMENTS

Allis-Chalmers Mfg. Co. 61
Books —
Engineering & Designing 40
General Motors Truck Co. Back Cover
Kritzer Co., The 40
Smidth, F. L., Co. 43

Sintering Grate and Rotary Kiln Gain Fuel Economy

Economic Aspects of the Lepol System—Fuel and Power Costs of Six Modern Manufacturing Processes Compared—Economies in Other Directions

By T. H. ARNOLD
Consulting Engineer, Plainfield, N. J.

The economic aspects of the sintering grate-rotary kiln burning process, discussed in this concluding article by T. H. Arnold, constitute, in the final analysis, the factors that determine the value of this new process to the cement industry.

In making his comparisons of fuel and power costs, under six different processes, the author has selected only the more recent developments in burning methods. The favorable showing made by this new process, when compared with other modern methods, suggests a real opportunity to plant managements that are operating with older equipment. That opportunity lies in the possibility of making a big advance at a single step.—The Editors.

(Concluded from the May Issue)

IN order to obtain a correct basis for an accurate comparison of economic advantages of the sintering grate-rotary kiln method of burning, it is quite essential to include in the comparison all phases which will have an effect on the financial returns of any of the systems compared. It is obvious that many features may be of minor effect in one system but of more importance in others. To be of any comparative value, all data must be reduced to a common basis. The application of general statements to any specific case must necessitate the evaluation of the specific requirements in that case to the same terms used in the presentation of the data given.

The results shown in the comparison are not given in a spirit of criticism of the various processes which represent stages in the development of the manufacturing methods under widely different conditions, and all represent progress beyond methods previously used. These results are not presumed to be the ultimate economy to be attained by any particular system. They are simply presented as the best operating results which have come to the attention of the writer as having been attained by plants falling under the various classifications.

The introduction of the waste heat boiler has introduced an additional complication into a fair comparison of burning methods. It necessitates the inclusion of the cost of power into any comprehensive comparison to place all methods upon an equitable basis. Thus a study of the cost of power generation in the modern base load station is required to complete the picture for those plants using purchased power.

The results have all been converted to the common basis of 12,500-B.t.u. (per lb.) coal delivered to the fuel feed bins of the kiln department at a cost of $5.00 per ton, including the cost of drying and pulverizing. These results may be readily converted to fit any individual case.

To summarize briefly the study of the modern base load station for the plants using purchased power, the following data are given as representing what may be attained by the large central stations in the United States.

	B.t.u. per kwh.	Over-all thermal efficiency, per cent
State Line station	12,500	27.3
Columbia station	14,000	24.4
Average large modern station	18,000	19.0

The theoretical amount of heat in one kilowatt-hour is 3,413 B.t.u. For plants operating with waste heat boilers we have assumed that 20 kwh. will be required per barrel, including the power used by the power plant, the waste heat boilers and the water system. For those plants the heat corresponding to the power used will thus be 68,300 B.t.u. per barrel, without considering the losses incident to the generation of the power. For those plants which purchase power we have assumed a power consumption of 18 kwh. per barrel in calculating the power cost. Including the losses in transmission and transformation, the heat value at the central station coal pile of the power used by the purchaser will be 61,500 B.t.u. per barrel without generation loss, and 382,000 B.t.u., actually. The thermal efficiency, including transformation, transmission, and distribution losses, will thus be 16.1 per cent.

The method outlined will give somewhat more economical results for the waste heat boiler than are usually attained in practice, as these results only consider operation at the most economical point. The efficiency of recovery in the waste heat boiler drops off very rapidly when less than full load operation is required by conditions originating in the cement plant requirements. Thus the generation of an adequate supply of power without the burning of an excessive amount of fuel at times becomes a very serious problem. Where the boilers and kilns are connected to a common flue the radiation is approximately constant in amount for all rates of production. The air leakage is greatly increased, as the sealing of the dampers for the various boilers and kilns is necessitated by shutting down these units. The losses become quite serious items at less than full rate, while below half capacity they may become prohibitive. In any event, to these losses must be added the burden of the constant plant load and the decreased efficiency of the turbo-generators at the low loads.

Cost of Power from Waste Heat Boilers

A conservative estimate of the cost of power to be generated from waste heat boilers must therefore include those periods when the plant is operated at less than full load. It must include the cost of the labor and supplies necessary to operate and keep in proper repair the boilers, the generating plant, the water-treating, pumping and cooling system, the boiler-cleaning and dust-removal system or any other equipment and buildings necessary to the generation of the power. As the power plant is a highly specialized industry and requires close supervision to maintain its high efficiency, a reasonable amount must be included in the cost of generation for this supervision. The following costs will thus be a conservative estimate for these items.

COST OF POWER FROM WASTE HEAT, PER KWH.

Operating and repair costs, including supervision	$0.0040
Taxes, insurance, inspections, interest, depreciation	.0035
Total cost	$0.0075

Thus in the further consideration of the cost of power from waste heat plants we have assumed a cost of $0.0075 per kwh. for the power.

Power and Fuel Costs Compared

In Table 4 and in the charts in Figures 11, 12, 13 and 14, the comparisons are based only upon the power and fuel costs for the various processes. While there were many other combinations which might have been included, the ones chosen are sufficiently representative to illustrate the merits of the general methods of burning. The typical plants chosen were as follows:

(1) Wet process with comparatively short kilns, filters for dewatering the slurry, and waste heat boilers to reclaim the heat in the waste gases.

(2) Dry process with comparatively short kilns, and waste heat boilers.

(3) Wet process with long kilns, equipped with chains, using purchased power and operated to obtain maximum output.

(4) Wet process with the same conditions as (3), except operation is for maximum economy.

(5) Dry process with long kilns for efficient heat transfer, and purchased power.

(6) Dry process with short kilns, sintering grate, and purchased power.

The comparison given in Table 4 includes only the more recent developments in burning methods, and thus does not attempt to bring a comparison with the older and more obsolete equipment which is still in use in many plants now operating. The performance with a combined fuel consumption of only 54 lb. of 12,500-B.t.u. coal for burning and drying, and the high thermal efficiency of the kiln, 68.6 per cent, thus represent a step far in advance of the methods available thus far.

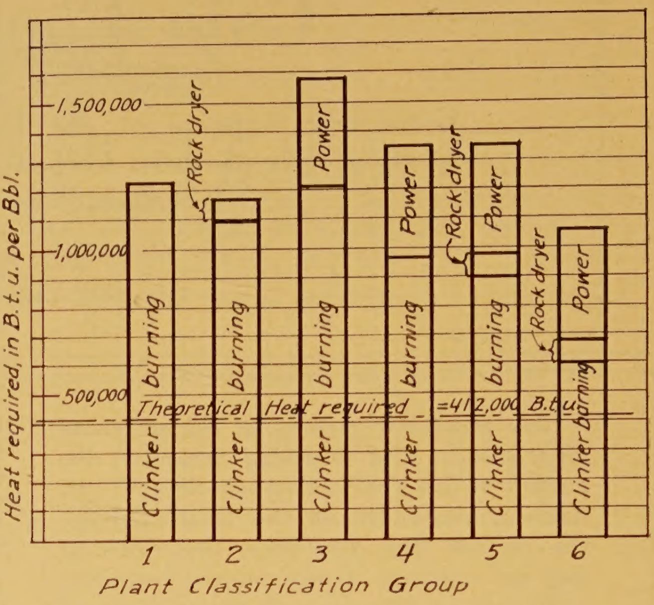


Figure 11. Comparison of cement burning methods. Heat required for kilns, dryers and power, in B.t.u. per bbl.

1. Wet process, filters and waste heat.
2. Dry process, waste heat.
3. Wet process, long kilns and purchased power, maximum output.
4. Wet process, long kilns and purchased power, maximum efficiency.
5. Dry process, long kilns and purchased power.
6. Lepol process, purchased power.

Kiln Dust Losses

Modern requirements, especially where a plant is located in a populous district, demand the elimination of any appreciable dust nuisance whether the expenditures to attain these results are economically justified or not. This tendency toward greater attention regarding the prevention of industrial nuisances is increasing rapidly and

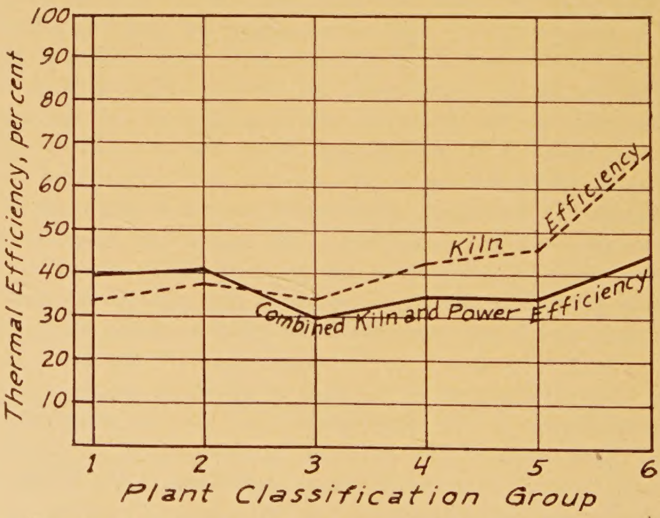


Figure 12. Comparison of cement burning methods. Thermal efficiency of kilns and power

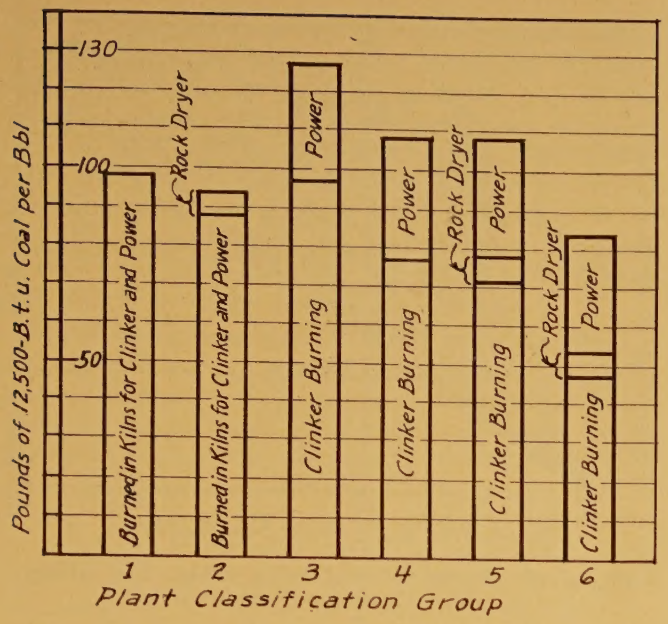


Figure 13. Comparison of cement burning methods. Pounds of 12,500-B.t.u. coal used for clinker and power

requires careful planning in the consideration of any expenditures for industrial processes at this time. The contention advanced in some quarters that the wet process will reduce these losses is not borne out in fact. Some of the wet process plants have equal or greater dust losses from the kilns than many of the dry ones. This is illustrated by the following data given by Evald Anderson, of the Western Precipitation Co., as results from plants where the recovery of dust was actually measured.

TABLE 5

Dust Recovery From Cement Kilns

Plant	Size of kilns in feet	Dust loss in lb. per bbl.
Wet Process		
1	6½x 78	40
2	7½x125	50
3	8x125	20
4	10x175	55
5	9x200	45
Average 5 wet plants		42
Dry Process		
1	7x110	25
2	8x125	34
3	10x150	53
4	7x180	6,632
Average 4 dry plants		36
Average 9 plants		39.3

Assuming that 380 lb. of clinker and gypsum are required to make a barrel of cement. If 12 lb. of gypsum are deducted, there remain 368 lb. of clinker. Assuming

TABLE 4

Comparative Efficiency of Heat Utilization and Combined Cost of Fuel and Power Required in Modern Cement Manufacturing Plants

Comparison Based on B.t.u. Per Barrel

	Kiln fuel		Efficiency,	Rock			Theoretical	Combined efficiency,
	Used	Theoretical	per cent	dryer	Power	Total used	total heat	per cent
1	1,220,000	412,000	33.8	—	—	1,220,000	480,300	39.6
2	1,095,000	412,000	37.6	75,000	—	1,170,000	480,300	41.1
3	1,213,000	412,000	34.0	—	382,000	1,594,000	473,500	29.7
4	968,000	412,000	42.6	—	382,000	1,350,000	473,500	35.1
5	900,000	412,000	45.8	75,000	382,000	1,357,000	473,500	34.9
6	600,000	412,000	68.6	75,000	382,000	1,057,000	473,500	44.7

Comparison Based on Pounds of 12,500-*B.t.u. Coal*

	Cement process					Total	
	Used in kilns	Theoretical	Dryers	Total	Power	Used	Theoretical
1	97.7	33.0	—	97.7	—	97.7	38.4
2	87.7	33.0	6.0	93.7	—	93.7	38.4
3	97.2	33.0	—	97.2	30.5	127.7	37.8
4	77.5	33.0	—	77.5	30.5	108.5	37.8
5	72.1	33.0	6.0	78.1	30.5	108.6	37.8
6	48.0	33.0	6.0	54.0	30.5	84.5	37.8

Cents Per Barrel Combined Cost of Fuel and Power. Based on Fuel Cost of $5.00 *Per Ton for Pulverized Coal in the Kiln Feed Bins, Purchased Power at* $0.01 *Per Kwh., and Waste Heat Power at* $0.0075 *Per Kwh.*

	Cement Process					
	Kilns					
	Used	Theoretical	Dryers	Total	Power	Total
1	24.40	8.25	—	24.40	15.0	39.40
2	21.85	8.25	1.50	23.35	15.0	38.35
3	24.25	8.25	—	24.25	18.0	42.25
4	19.35	8.25	—	19.35	18.0	37.35
5	18.00	8.25	1.50	19.50	18.0	37.50
6	12.00	8.25	1.50	13.50	18.0	31.50

35 per cent of volatile matter in the raw mix, then neglecting the dust loss, there will be required 566 lb. of raw material to make a barrel of cement.

In any consideration of dust losses the coal ash must be included in the total raw materials. In the ordinary burning process from 30 to 60 per cent of the coal ash is recovered in the clinker contamination. The balance goes out through the stack with the gases. In the Lepol system, as in other methods of dust recovery, the coal ash will practically all appear in the precipitated material. However, the radical reduction in the ratio of the coal weight to the weight of raw material will bring the relative importance of the contamination from this source back to the same general results. The importance of the weight of the ash in the coal, per barrel, is shown in Figure 15, which gives the amount of ash for coals of different ash content with varying ratios of coal and raw material.

Assuming in the above case of the average of the nine plants with a dust loss of 39.3 lb. per bbl., the dust loss may be calculated as follows: Assuming a coal with an ash content of 10 per cent and a consumption of 78 lb. per bbl., then the ash will amount to 7.8 lb. per bbl. Thus we may assume that the dust represents an increase of 39.3 lb., less the coal ash of 7.8 lb., or 31.5 lb. However, the percentage of volatile in the original raw material was 35 per cent, but in the dust from the stacks and treaters it had been reduced to 7 per cent, indicating that a partial calcination had taken place. Thus correcting for the loss in volatile, there were required 43.8 lb. of the original raw material to supply the dust loss in addition to the coal ash. If the pulverized raw material will cost $0.65 per ton as delivered to the kiln feed bins, and there are required 610 lb. to make a barrel, the cost of the raw materials will be $0.1985 per bbl.

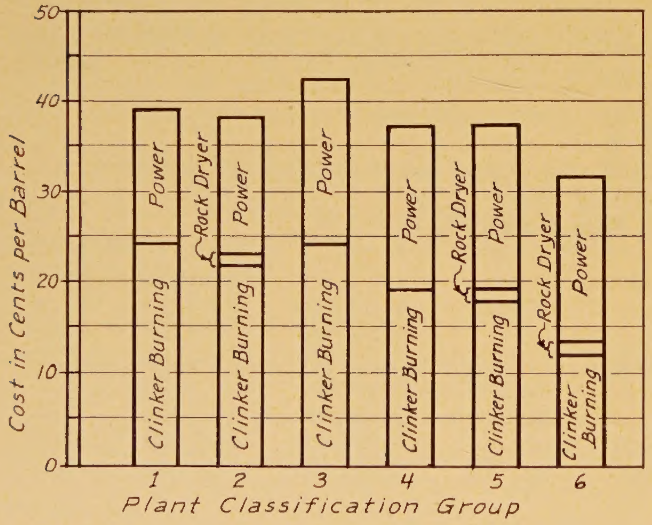


Figure 14. Comparison of cement burning methods. Cost of fuel and power, in cents per bbl.

The corresponding conditions for the Lepol process will be as follows: Assuming the same raw materials without dust loss will require 566 lb. of raw material. The dust loss will not be in excess of 3 per cent of the raw materials, or 17 lb. The coal consumption would be 48 lb. of the 10 per cent ash coal, with a total weight of ash of 4.8 lb., leaving 12.2 lb. of dust from the raw materials. With a volatile content of 7 per cent this amount of ash would require 17.0 lb. of the original raw material. The total weight of raw materials would be 583 lb. At the cost of $0.65 per ton for the raw materials in the kiln feed bins the cost of the raw materials will be $0.1895 per bbl. Thus in the use of raw materials there will be a considerable saving in operating cost in favor of the Lepol process. In this case it would be $0.009 per bbl. without any additional outlay for dust-collecting equipment.

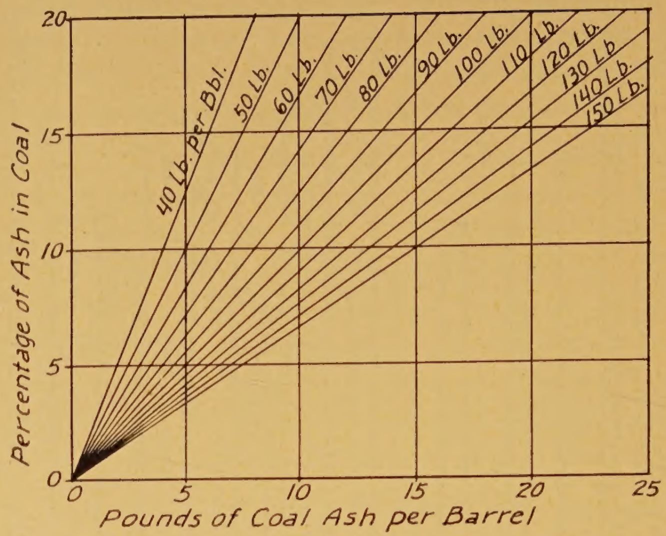


Figure 15. Weight of coal ash per bbl., for various ratios of coal and materials

Forcing Rates

All the installations of the Lepol system made up to the present time have been made in Europe, where the high output rates of American practice are not looked upon as economical. Thus none of these kilns have been pushed to their ultimate capacity. Very little data of an accurate nature are available on the effect of high output rates upon the fuel economy of the rotary kiln. In the normal rotary kiln the ultimate limit depends either upon the temperature effect of the flames destroying the exposed brickwork, or upon the gas velocity in the burning zone being increased to beyond the ignition velocity of the fuel mixture. Below these points there is quite a wide margin in which the kilns may be operated. While the increased flame temperature at the higher rates will

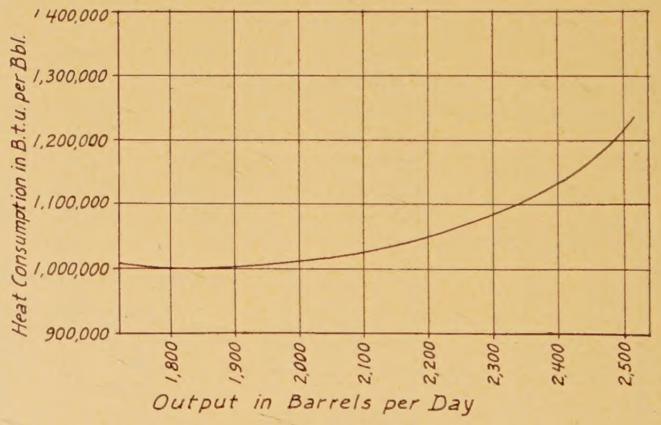


Figure 16. Variation of fuel rate with output, for long wet-process rotary cement kiln

result in some additional heat transfer, and the addition of chains or other heat transfer apparatus will assist materially in the recovery of the heat, still any increase beyond a certain point will result in a greater portion of the heat being carried out with the gases. This is illustrated in Figure 16, which shows the relationship between the fuel and the raw material over a wide range in output. The chart in Figure 16 was plotted from the results attained on a wet process kiln, with chains to increase the heat transfer from the gases to the materials.

The flexibility available in the various relationships of the materials and the apparatus with the Lepol process allows adjustments which may be of material assistance in operating at the higher rates while maintaining the low gas temperatures which are necessary in the exit gases to assure good operating efficiency. Variations in the thickness of the bed of materials, in the size of the nodules, in the speed of the grate travel, in the draft, all offer considerable possibilities for the absorption of a greater percentage of the heat on the grate if it is desirable.

Equalizing of the Draft on the Grate

The equalization of the draft over the various portions of the grate is accomplished by an intrinsic compensating feature of the process which tends to reduce the proportion of the gases passing through the hottest material near the discharge end of the grate. As the gases pass through the bed of material, they leave behind them the dust which they carry. This dust is deposited upon the surface of the nodules and gradually tends to fill the openings between them. The cooler materials at the feed end of the grate have a comparatively small dust coating which increases progressively as the material moves toward the discharge end. This dust coating increases the gas friction through the bed and thus reduces the relative amount of gas passing through a given area of the grate. Owing to this automatic adjustment of the ratio of the gas to the temperature of the material, the difference in the temperature of the gases leaving the various parts of the grate is far less than might be expected. Thus the dust-collecting feature which is inherent in the process serves in a useful way to accomplish a result which might prove difficult of attainment by other means.

In order to visualize the effect of the installation of a Lepol kiln on the plant operations in general, the following example is given. This is based on a composite study of the results to be expected in several installations and is verified by the results attained in several plants now in operation. Naturally each plant will present its own peculiar problems. Thus the data and installation costs given must be regarded as quite general and merely comparative.

High-Early-Strength Cement With 44 Lb. of Coal

In a letter addressed to the Cement Mill Edition of CONCRETE, Julian Rezola, industrial engineer for a cement plant at Angora, Spain, asserts that a kiln of the Lepol type installed in their plant is producing high-early-strength cement with an average coal consumption of 44 lb. to the barrel of finished cement.

Expressed in another way, the fuel requirements amount to 587,800 B.t.u. per bbl. (380 lb.) of clinker. The output during a test run made late in 1931 was 238.5 metric tons (1,398 bbl.) of clinker in 24 hours.

Assume for this case that we have a plant with four kilns 10 by 150 ft., having an average output of 1,180 bbl. per day while using 85 lb. of 13,100-B.t.u. coal per bbl. The coal costs $5.25 per ton delivered in pulverized form to the kiln feed bins. There are required 610 lb. of raw material to make one barrel of clinker. The raw material costs $0.65 per ton delivered to the kiln feed bins.

With the Lepol system the corresponding results will be considerably changed. The kilns will be shortened to 112 ft. in length and the sintering grate will be added. The coal consumption will be reduced to 45.8 lb. per bbl. The output will be increased to 1,450 bbl. per day. The amount of raw material will be reduced to 583 lb. to make a barrel of clinker.

The various operating conditions will be as follows for the two processes:

	Present system	Lepol system
Size of kilns	10x150 ft.	10x112 ft.
Output per kiln per day	1,180 bbl.	1,450 bbl.
B.t.u. per pound of coal	13,100	13,100
Pounds of coal per barrel	85	45.8
B.t.u. per barrel of clinker burned	1,112,000	600,000
Cost per ton of pulverized coal	$5.25	$5.25
Cost of coal per barrel	$0.2230	$0.1205
Fuel savings per barrel	———	$0.1025
Cost of pulverized raw materials per ton	$0.65	$0.65
Pounds of raw materials required for 1 bbl.	610	583
Cost per barrel for raw material	$0.1985	$0.1895
Saving per barrel on raw material	———	$0.0090
Output of 4 kilns per day	4,720 bbl.	5,800 bbl.
Tons of raw material per day	1,440	1,690
Increase in burning capacity	———	1,080
Daily saving in dust over present operation	———	85 tons
Materials saved will make		292 bbl.
Additional materials required to make 788 bbl.		235 tons

Thus the savings in fuel and raw materials will total $0.1115 per bbl. This saving is largely independent of the annual production rate. Combined with this saving is an increase in the production capacity of the kiln, in this case 270 bbl. per day per kiln, or 1,080 bbl. per day on the plant.

Cost of Installation

So many conditions will affect the cost of installation that no two plants will have exactly the same problems to meet. The cost will thus vary greatly with the individual installations. Therefore any general figures would only be deceptive in case the conditions assumed differ materially from the particular case considered. The kiln length of 100 to 125 ft. for the larger sizes will reduce the cost of the building very considerably, as well as the cost of the foundations and driving units. The sintering grate, with its connecting flues, dust hoppers and auxiliary apparatus is compact and occupies a comparatively small building volume. The grate, hydroballer and other equipment are all simple, sturdy, and do not require a high cost for intricate machining or difficult workmanship. The installed cost per barrel of annual capacity will be far less than the waste heat boiler with its attendant turbo-generator and water system, and it does not require the complete rebuilding of the plant, as does the long kiln.

Financial Justification

In the average installation the savings in the fuel and raw materials will show a very satisfactory return on the investment. Usually these savings will return the cost of the equipment in one to two years. In addition to the savings shown, the increased production capacity of the kilns has a value which is very real. Usually the output of the plant is limited by the kiln capacity.

The elimination of the dust from the kiln stacks dispenses with the necessity for the large investment required to install a dust precipitation plant, with the attendant overhead, operating and repair charges. This may be evaluated and should be placed as a credit to the process.

Undoubtedly a plant with these marked savings in manufacturing costs will be enabled to operate with a much higher production rate than one whose manufacturing costs are greater. It is elementary economics and a very generally practiced principle to operate the lowest cost producers most continuously and to supply the excess production from the less economical units. Thus a plant, with the outstanding advantages assured with this process, will operate with a far higher production rate than one less favorably situated. This increased operating rate will give a marked reduction in the overhead charges. In some plants this reduction may be even greater than the saving which originated the increased production. No general statements or estimates can be given of this saving, which must be considered for each plant individually from its own particular requirements.

Conclusions

The data and observations on this process have been presented to the American cement industry with the hope that they may constitute a helpful suggestion in solving some of its present difficulties. Whatever the causes leading up to the existing conditions of the cement market, these conditions must be recognized and measures taken to meet them. It would appear that the present low prices are likely to continue over a considerable period. A policy of utilizing all available commercial developments to reduce manufacturing costs must be adopted. The industry must equip itself to manufacture and sell its product profitably in the present market.

Those companies who frankly face the issue and readjust their manufacturing and selling facilities to place themselves on a profitable basis in the present market will weather the storm and will reap their reward when prices do eventually show a tendency to rise. This will not be accomplished by following the beaten track of previously standardized experience. The many new developments in process which have been cast aside as likely to interfere with production while being tried out must now be relied upon to bring the industry back to a profitable basis.

Now as never before it becomes the duty of every plant management to incorporate in its plants every improvement which is based upon sound engineering and economic principles. The fuel loss still remains the largest single loss in the cost of manufacture. Naturally it offers the greatest opportunity for return on the investment necessary to save a portion of it. The Lepol process, by reducing this loss to a minimum, strikes at the root of the largest item of loss in the modern plant. It offers the most substantial reduction in manufacturing costs which has been brought to the attention of plant operating officials in recent years.

Present Technical Papers Before German Cement Manufacturers

The annual meeting of the Association of German Portland Cement Manufacturers, held in Berlin on March 15 and 16, saw the presentation of a number of valuable technical papers on various phases of cement manufacture.

Dr. W. Eitel discussed the mathematics commonly employed in determining heat balances in cement kilns, pointing out that the values obtained by W. P. White agree with recent measurements of the specific heat of clinker.

Dr. G. Haegermann presented a paper on the reactions, at sintering temperatures, that occur between lime and silica, alumina and iron oxide. Among other conclusions he finds that while tricalcium silicate is the actual supporter of hardening, the presence of aluminates is necessary as a means of exciting the hardening action.

Dr. H. Kuhl read a paper in which he presented the hardening of cement as a colloidal problem. Calcium aluminates, he stated, also harden in a similar manner. This is the case with alumina cement, which is one of the best examples.

Other technical papers included one by Dr. Hummel, on limiting sieve lines and fineness modulus of aggregates; one by Dr. Goslich, on the development of pneumatic conveyors for transporting cement in cement plants; and one by Dr. Nacken, on the setting processes occurring when water is added to cement.

New National Co. Prepares to Ask for Machinery Bids

Bids for machinery for the plant to be constructed by the newly organized National Portland Cement Co., at Brodhead, Northampton County, Pa., were to be sent out the first week in June.

The same week was also to see the new office building there completed and occupied.

Highway Department Uses Hot and Cold Cement in Test

Whether cement used in highway paving is hot or cold is immaterial, according to the Indiana state highway department.

A test road near Gary was placed recently using both hot and cooled cement from the nearby Universal Atlas plant and no difference was found in the paved sections.

Low Installation and Operating Costs Features of Dust Collector

Five Units at Marquette's La Salle Plant Hooked Up With Waste Heat Boiler System—Spinning Action of Air Simulates Funnel of Tornado

THE primary purpose of a dust collector installation in a cement mill is to prevent or eliminate the dust nuisance—whether considered from the standpoint of the mill workers or the community. The secondary purpose of dust collection is that of recovering the dust and returning it to the mill stream; for, after all, the dust has some value. However, if the value of the reclaimed dust were the only consideration involved, it is doubtful that the cement industry would assume the expense of collecting it. Only during the World War, when the normal commercial imports of potash from Germany were cut off, did some cement companies find it profitable to collect the potash in the kiln dust. With the regular sources of potash restored after the war, the recovery of potash from kilm dust was no longer profitable, and dust collection again became a question largely of eliminating a nuisance.

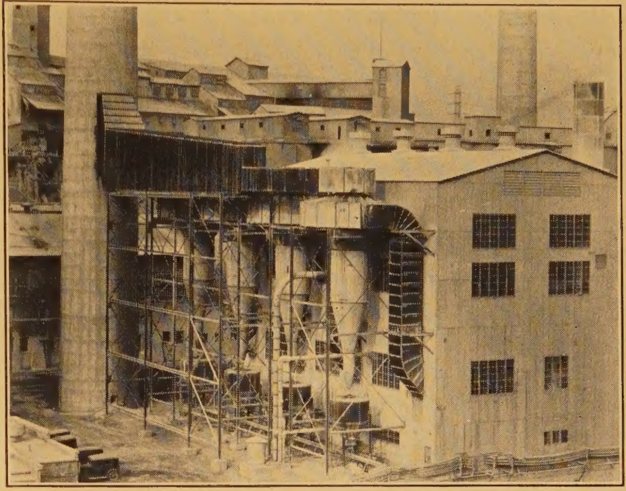


Figure 1. General view of main plant, showing "Sirocco" dust collector units hooked up with the waste heat boiler system

Low Installation and Operating Costs

Because of the relative unimportance of the *value* of recovered dust, and the fact that the primary purpose of dust recovery is the removal of a nuisance, some cement plant executives take the attitude that low first cost, together with low operating and maintenance costs, should be given first consideration in the installation of a dust collecting system. These items are of far greater importance, in their opinion, than high efficiency in dust

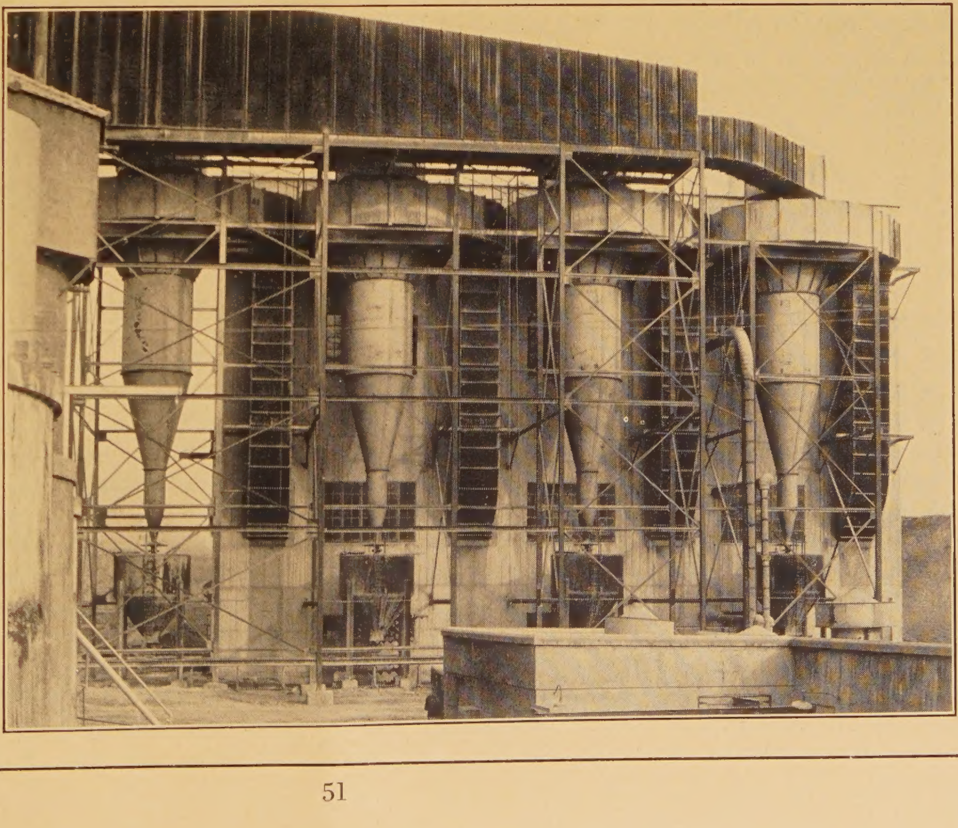


Figure 2. Close view of collector units

removal, provided the system removes a reasonably high percentage.

When recovering the dust from kiln gases, in cases where a waste heat boiler system has been installed to utilize the heat of those same kiln gases, it is a distinct advantage to have the dust collecting system so designed that the dust will be stopped before it enters the fans. In fact, one of the bugbears around a waste heat boiler installation is the task of keeping the fans running in the presence of abrasive dust.

Five Collector Units at La Salle Plant

An interesting dust collecting system which has been in operation since November, 1928, is shown in the illustrations, this installation having been hooked up with the waste heat boiler system that utilizes the heat of the kiln gases at the La Salle (Illinois) plant of the Marquette Cement Manufacturing Co.

Figure 1 shows a general view of the main part of the plant and the collector units that comprise this installation. Figure 2 is a close view of the same units. Figure 3 is a sectional drawing of one of the units, prepared to provide a clearer understanding of the operation of this dust collector.

This collector unit constitutes what is known as a closed system, so designed that the dust-laden air or gases may either be blown through it or drawn through.

Operation of Collector Unit

Referring now to the drawing (Figure 3), the dust-laden kiln gas enters the volute-shaped scroll at the top through a rectangular inlet. The air current, moving at a velocity of 2,000 ft. per min., enters this scroll tangentially, causing the current to spin around in a path following the peripheral shape of the volute. Because of this spinning motion the dust particles, being heavier than the air or gas, are forced outward against the periphery.

Separation by Centrifugal Action

Since the action of this separation is centrifugal, the separating effect increases as the dust moves downward through the unit, and as the radius of the volute decreases, because of the increase in the angular velocity of the spinning current. The unit, as the illustrations show, consists of alternating truncated cones and cylinders, and the spinning motion of the downward air current is not unlike the action of the "funnel" of a tornado.

Formation of Rarified Vortex

Due to the centrifugal action of the spinning air current and the increasing angular velocity as the radius of the volute decreases, the greater part of the dust particles of all sizes are forced outward toward the periphery. In the meantime the cleaned air or gas forms a rarified vortex in the center of the collector and passes upward through the outlet. Any dust remaining in this vortex settles the more easily, since suspended particles drop through rarified air more readily than through air of ordinary density.

Removal of Dust from Unit

The base of the vortex is formed immediately above the dust outlet at the bottom, where a decided suction is present. Here the dust particles drop into a sealed receptacle which is shown in all the illustrations. In this receptacle the air pressure is negative, which fact necessitates a perfect air seal in order to prevent the flow of air upward through the collector thus destroying its efficiency.

From the receptacle at the bottom the dust passes into a system of pipes through which it is returned to the dust storage bins and fed back into the kiln with the raw meal.

Preliminary Experiments with Test Collector

The collectors at the La Salle plant were installed after thorough experiments had been made by the plant operating personnel with a test collector which had a capacity of 1,000 cu. ft. of air. This preliminary investigation included also the determination of the physical properties of the kiln dust, such as its screen analysis and the weight per cu. ft.

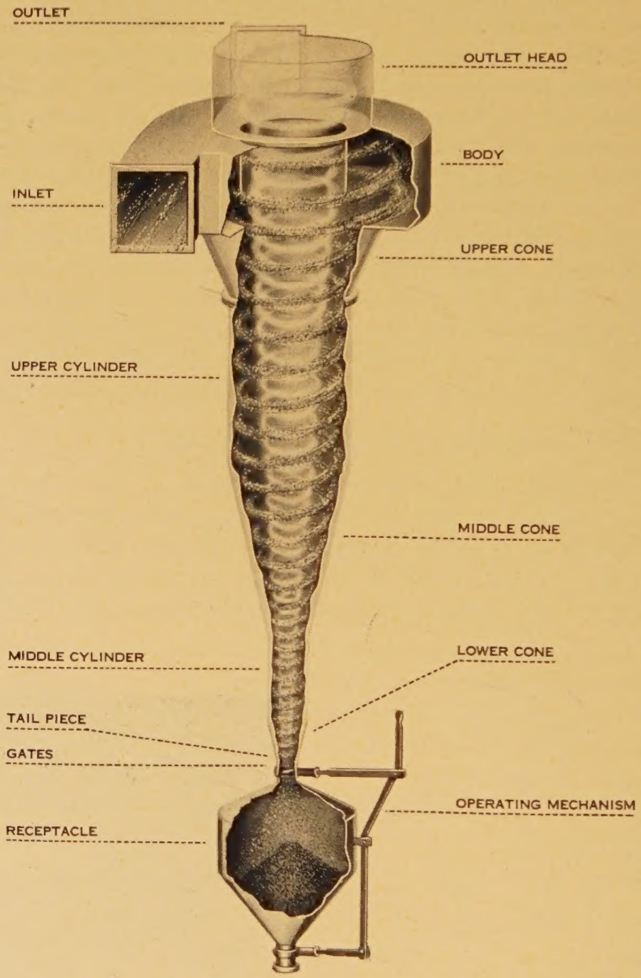


Figure 3. Sectional drawing of "Sirocco" dust collector unit, showing its operation

Where it seems impracticable to operate a test collector at the plant, tests are run at the manufacturer's laboratory under conditions approaching as nearly as possible to actual operating conditions.

Construction of Collector

The collectors at the La Salle mill are of the usual construction for units of this height—about 65 ft. The shell consists of ¼ and 5/16-in. steel plates. The lower third of the collector is sometimes built of cast iron to resist the heavy abrasion to which the lower part of the collector is subjected. On this particular installation the entire unit is built of steel plate.

Following the usual practice, the collector units are thoroughly braced in a framework of structural steel, and are supported on steel beams underneath the large volute-shaped scrolls at the top.

Applied to Various Dust Problems

The type of collector here described is not limited to the collection of kiln dust, but is equally applicable to the dust collection at the raw and finish mills, at coal dryers, stone and clay dryers, and similar locations. Other installations in cement plants cover these various dust problems. In all cases the dust is collected in a dry condition, ready to be returned to the bins or to the mill stream.

Acknowledgments

The collectors here described are known as the "Sirocco" type "D" collector, manufactured by the American Blower Corporation, Detroit, holders of the American license under the Whitmore inventions. The American Blower Corporation is a subsidiary of the American Radiator-Standard Sanitary Corporation.

The design and supervision of the La Salle installation were handled by the Chicago office of the American Blower Corporation, under O. B. Cahoon, staff engineer.

Investigating Reaction of Water on Calcium Silicates

Study Combined Effects of Hydrolysis and Hydration—What Test Results Have Shown

Although compounds of calcium and silica are among the major constituents of portland cement and are largely responsible for its hydraulic properties, little is known concerning the reaction of these compounds with water. It was the purpose, therefore, of an investigation undertaken by the U. S. Bureau of Standards, to obtain quantitative data which will indicate the role of the calcium silicates in the hardening of cement.

Metastability Related to Silica Content

Accordingly, a study has been made by the bureau of the combined effects of hydrolysis and hydration of $3CaO.SiO_2$, beta $2CaO.SiO_2$ (constituent of portland cement), and also $CaO.SiO_2$. When shaken with water the two former compounds form metastable solutions while $CaO.SiO_2$ does not, and this is believed to account in part for the fact that $3CaO.SiO_2$ and $2CaO.SiO_2$ are hydraulic and that $CaO.SiO_2$ is not. Metastable solutions obtained at progressive stages of the hydrolysis of $3CaO.SiO_2$ and beta $2CaO.SiO_2$ show a steady decrease in silica content with increase in lime content and a corresponding decrease in metastability. On standing, the metastable solutions decompose with the formation of colloidal or microcrystalline precipitates. Petrographic examination of these precipitates has failed to reveal any crystal form or identify the phases present.

Analyses of the solutions, in the clear metastable state and after attaining equilibrium show that the precipitates contain lime and silica in mol ratios varying from $1.1CaO:1SiO_2$ to $1.8CaO:1SiO_2$, depending upon the concentrations of the lime in the solutions with which they are in contact. If precipitation takes place in almost saturated limewater it is believed that the precipitate will approach the mol ratio, $2CaO:1SiO_2$, and this assumption is being tested.

Tricalcium silicate hydrolyzes very rapidly, giving an almost saturated lime solution after four hours' shaking. Hence the precipitates derived from it have a higher lime content than those from beta $2CaO.SiO_2$, which liberated lime and silica to the solution more slowly. Also beta $2CaO.SiO_2$ almost completely loses its metastable solubility in solutions containing more than 0.5 gram per liter, whereas $3CaO.SiO_2$ retains its metastability in nearly saturated limewater.

Action of Monocalcium Silicate

Monocalcium silicate when shaken with water gives only stable solutions and reaches its maximum solubility at a concentration of about 0.111 gram CaO and 0.106 gram SiO_2 per liter. A quantity of $CaO.SiO_2$ solution was made up and mixed with saturated limewater in various proportions. The precipitates so obtained were found to contain lime and silica in mol ratios varying from $1.0CaO:1SiO_2$ to $1.7CaO:1SiO_2$ and contained somewhat less lime than precipitates derived from $3CaO.SiO_2$.

The pH measurements upon calcium silicate solutions indicate that they consist of monocalcium silicate in the presence of excess lime.

Solubility of Silica

The "equilibrium" solubility of SiO_2 has been further investigated by boiling highly purified silica gel with dilute limewater for long periods of time, followed by cooling to the desired temperatures. Such experiments show the maximum solubility of SiO_2 at 30 deg. C. is about 0.25 gram per liter at a CaO concentration of about 0.07 gram per liter. Silica is taken up in excess of this amount to form a bluish or opalescent colloidal solution. Such a solution was made up containing 0.4550 gram SiO_2 and 0.0246 gram CaO per liter and was mixed with saturated limewater in various proportions to form a series of solutions. Analysis of these solutions and of the hydrated calcium silicates precipitated from them is expected to give important data on the system $CaO\text{-}SiO_2\text{-}H_2O$ at 30 deg. C.

Snader Conclusions to Appear in July Issue

Conclusions regarding the physical properties of the components of cement will be described in the July issue by D. L. Snader.

He will describe in detail the results obtained in the study he made with R. J. Colony.

The July installment will comprise the concluding chapter of a series published monthly in CONCRETE beginning in the February issue.

EDITORIAL

Manitowoc's Predicament

THE controversy between the Manitowoc Portland Cement Company and the Wisconsin state highway department has been settled, but not without giving the cement industry a painful object lesson on the withering effects of price wars. The industry has learned also that a contract with a state or other political division may not necessarily be a contract. It may be just another scrap of paper.

As the first step in the recent events which have proved so embarrassing to the Manitowoc plant (a subsidiary of the Medusa Portland Cement Company), the Wisconsin highway department received bids on 1,150,000 barrels on November 28, 1931. The eleven mills that offered bids quoted the same price, which was in line with previous bids received by Minnesota and Iowa. The Manitowoc Portland Cement Company, which operates the only cement mill in Wisconsin, was awarded the contract for an allotment of 425,000 barrels, at a price of $1.03, figuring in the freight allowance. Another Medusa-owned mill, at Dixon, Illinois, submitted bids on 91 of the 95 destinations included in the Wisconsin requirements. Still another bidder was the Alpha Portland Cement Company plant at La Salle, Illinois, which was awarded an allotment of 50,000 barrels.

Early in January the Illinois state highway department took bids on 5,000,000 barrels. This unusually large quantity precipitated a local price war which resulted in bids at net mill prices considerably lower than those quoted in the bids submitted to Wisconsin. The Medusa-owned plant at Dixon, Illinois, was one of the Illinois bidders, at the lower net mill prices.

The Alpha Portland Cement Company was low bidder on 1,300,000 barrels in Illinois, whereupon this company notified the Wisconsin highway department that it would fill its 50,000-barrel Wisconsin contract on the basis of its Illinois bid. This proposal was approved by the Wisconsin highway department, and immediate steps were taken to obtain similar price reductions from the ten other mills which held Wisconsin contracts. At a meeting held on March 23 the highway commission notified the cement companies that unless they reduced their prices to a basis comparable to the Illinois quotations the commission would not fill its orders, but would direct highway contractors to furnish the cement.

Several mills complied with the demand, but Manitowoc offered stiff resistance. The Manitowoc plant had not bid on the Illinois contracts, but the Wisconsin commission took the position that the bids of the Dixon mill, another Medusa plant, were in reality binding on Manitowoc, since both mills are under the same ownership.

Eventually the Manitowoc company accepted a new contract calling for the increased amount of 600,000 barrels, but at a reduction of 13 cents per barrel. The highway department cancelled the contracts with mills that did not agree to the reduction.

The predicament in which the Manitowoc Portland Cement Company found itself as a result of these events was a most embarrassing one; but this is precisely in line with what must be expected in a price war.

A Threat and An Opportunity

AN editorial headed "In Cents per Barrel and Dollars per Year," printed in our issue of December, 1931, emphasized the importance of presenting the results of laboratory and plant investigations in language and figures that carry a definite message to the minds of the managing executives of the industry.

T. H. Arnold has met this requirement in his series of articles concluded in this issue on the sintering grate-rotary kiln method of burning. He has supplied an exceedingly large amount of usable information in the form of definite facts and figures.

The concluding article in this issue, on the economic aspects of this new method of burning, is no exception to the rule. His cost comparisons are made, not with processes utilizing obsolete equipment, but with the more recently developed systems that have good cost reduction records to their own credit.

Here is both a threat and an opportunity to the management of plants that have not been modernized in recent years. The threat lies in this additional proof that progress has not ceased in the march toward lower production costs, and that plants which attempt to continue operation with old equipment must in due time drop out of the procession.

The opportunity lies in the fact that this new method utilizes short rotary kilns, such as are found in the older installations. In consequence, it may be possible to modernize some of the older mills without the necessity of making an excessive expenditure.

While each non-modernized mill constitutes a problem in itself, the managing executives of such plants may find their salvation in a thorough study of the possibilities presented in this new system of burning.

Electric Dewatering of Slurry Under Four-Year Test[1]

Tests With Continuous Electrophoresis Machine—Electric Power Requirements—Probability of Lower Power Costs Than Shown by Experimental Machine

By HEWITT WILSON[2] and H. G. WILCOX[3]

(Concluded from May Issue)

THIS concluding installment describes the tests with the continuous electrophoresis machine at the Northwest Experiment Station of the U. S. Bureau of Mines, during the experiments with electric dewatering of cement slurry.

Other features of this final installment include a statement of the power requirements in this method of dewatering.

TESTS WITH CONTINUOUS ELECTROPHORESIS MACHINE

The continuous electrophoresis machine was constructed by Howard S. Davis and modified by Curtis.[14] Figure 3, a diagram of the machine, is taken from Curtis' paper.

Description of Apparatus

The machine consists of a metal tank K in which a 12 by 8-in. drum-shaped, type-metal anode A revolves. The anode and cathode are insulated from the framework of the machine and from each other. The cathode B is suspended below the anode A by metal rods which are supported by the threaded metal posts c,c. The anode-cathode spacing is regulated by nuts on these posts. The scraper D is held against the drum A by a spring E. The rotation of the drum in a clockwise direction is caused by an electric motor I, working through a 100-to-1 reduction gear H which is connected by a chain and sprocket to the shaft of the drum A.

The direct current enters the machine, after passing through an ammeter and voltmeter, through a movable contact which presses against the drum shaft at F. The current is carried to the inside face of the drum by wires attached to the shaft. It passes through the suspension to the cathode and out through a wire connected to the cathode at C.

The material is fed to the machine through a perforated trough suspended from the posts c,c on the side opposite the discharge G. The connection of the feed trough at c,c keeps it negatively charged, and all the entering material passes into the tank through small holes in the trough bottom. The false bottom in the tank L permits tests to be made with less material; and with the method of feeding used, the material can be kept almost completely within the electric field between the electrodes.

Curtis' feed was distributed evenly along one side, but the overflow was taken off through a narrow opening on the opposite side, thus causing an increased rate of flow at G. This did not cause any trouble with the fluid clay suspension, but with the more viscous slurry the overflow would not carry off the material as fast as it was fed in. A series of openings was made along tank K at the same level as G. A small sloping launder was attached to the front of the tank to catch the discharge from these holes. This method of discharge creates an even flow through the machine.

Notes on procedure.—The time of submergence of a given point with anode in the slurry was kept constant at one minute and 12 seconds. The rate of flow was con-

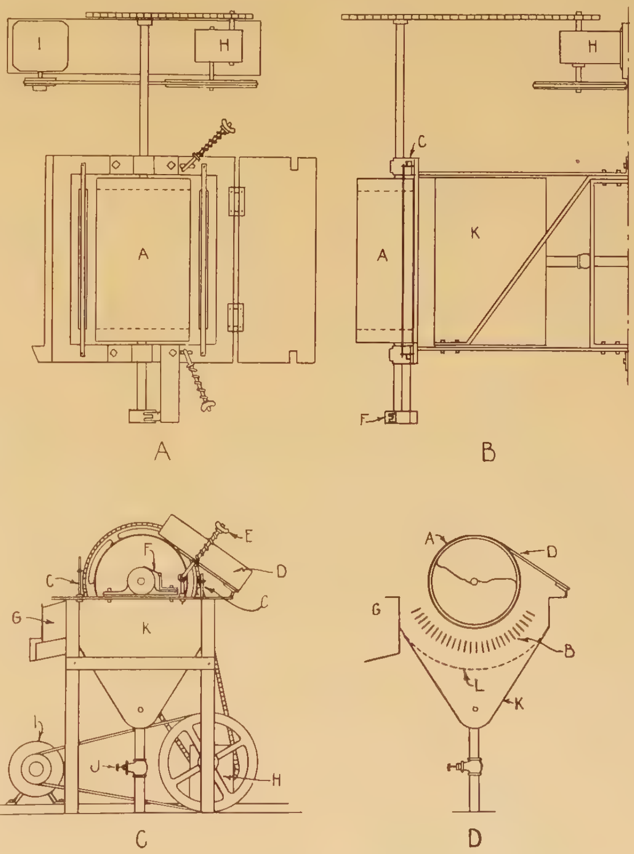


Figure 3. Experimental continuous electrophoresis machine

---

[1] Published by permission of the Director, U. S. Bureau of Mines (not subject to copyright).

[2] Engineer (non-metallics), U. S. Bureau of Mines, Northwest Experiment Station, Seattle, Wash.

[3] Research fellow, U. S. Bureau of Mines, Northwest Experiment Station, Seattle, Wash.

[14] See footnote 4, in April issue.

trolled by a valve in an overhead tank. The deposit first formed on the drum contained more water than that which was deposited later, so that which formed in the first 1½ minutes was not used. The length of the runs varied from 1 to 5 minutes.

Some trouble was experienced in some of the tests by the deposit peeling from the heated drum and falling back into the tank before it could be removed by the scrapers. This could be corrected by increasing the anode-cathode spacing, reducing the power input, or increasing the rate of slurry flow.

Experimental Results

Increased voltage.—Slurry, in which the viscosity had been lowered by using 0.025 per cent of sodium silicate and 0.3 per cent of sodium carbonate, was used for these tests. The results shown in Table 4 indicate that increased voltage greatly increased the amount of material taken from the suspension, increased the dryness of the deposit slightly, increased the per cent of water removed, and increased the amount of dry slurry per kilowatt-hour.

Rate of flow and increased speed of drum.—Increased rate of feed or flow through the machine caused slight changes (Table 5), but all are within the limit of experimental error. The circulation of slurry should be rapid enough for maximum deposition and proper cooling, but should not produce erosion of the deposited layer. Increased speed of the drum gave a decrease in rate of deposition (Table 5), and an increase in the power required per unit weight of deposit.

A comparative test was made on the rotating machine with a single perforated plate cathode which had a 1:2.46 ratio of submerged anode to cathode area and a grid cathode with a 1:15.7 submerged anode to cathode ratio. The data obtained from both tests were very similar and indicated no effect from the increased cathode area (Table 6).

TABLE 4

Effect of Increased Voltage

Amperes	Volts	[1]Dry slurry recovered, lb. per hr. per sq. ft. anode surface submerged	Solids in anode deposit, per cent	Water removed, per cent original water basis	Water removed, lb. per kwh.	Dry slurry recovered, lb. per kwh.
30	70	63.4	75.0	45.7	6.4	23.1
28	90	91.3	76.5	50.3	8.5	27.6
39	109	237.0	78.0	53.8	14.2	42.6

[1]Recovered as anode deposit and then dried.

TABLE 5

Effect of Rate of Flow and Speed of Drum

Amperes	Volts	Dry slurry recovered, lb. per hr. per sq. ft. anode surface submerged	Solids in anode deposit, per cent	Water removed, per cent	Water removed, lb. per kwh.	Dry slurry recovered, lb. per kwh.
43	77	68.0	76.8	50.5	4.3	13.7
[1]43½	78	66.7	76.2	49.5	3.9	13.1
[2]44	82	49.0	76.2	49.0	2.7	9.1

[1]Fifty per cent increased rate of flow over that of the first test.
[2]Fifty per cent increased speed of drum over that of the first test.

TABLE 6

Effect of Change of Ratio of Anode-Cathode Area

Cathode	Amperes	Volts	Dry slurry recovered, lb. per hr. per sq. ft. anode surface submerged	Solids in anode deposit, per cent	Water removed, per cent original water basis	Water removed, lb. per kwh.	Dry slurry recovered, lb. per kwh.
Single plate	43	77	68.0	76.8	50.8	4.3	13.7
Multiple grid	44	75	69.8	76.1	49.5	4.2	14.1

Effect of Cottrell precipitates.—In the preceding tests no Cottrell precipitates had been added to the slurry. It was found that the slurry was thickened by the addition of the precipitator dust and greater quantities of alkali were necessary to reduce the viscosity sufficiently to flow freely through the electrophoresis machine. It is understood that molasses is now in use at the cement plant to prevent thickening and setting of the slurry. The electrical dewatering tests indicated variable results similar to the preceding experiments, and they probably agree within the limits of experimental error.

Electrical power cost for dewatering.—The most efficient results obtained in 18 experiments with the continuous rotating apparatus were produced by the following combination factors:

Volts	109
Amperes	39
Watts	4,251
Alkali added, per cent dry weight of slurry:	
Sodium carbonate	0.3
Sodium silicate	0.025
Specific viscosity, compared with water	1.65
Time of submergence of anode, minutes	1.2
Ratio of cathode to submerged anode area	2.46
Spacing between electrodes, inches	1.75

The following results were produced:

Dry slurry recovered, lb. per hour, per sq. ft., anode surface submerged	237
Solids in anode deposit, per cent	78
Water removed, per cent original basis	53.8

Power required:

Dry slurry recovered, lb. per kwh.	42.6
Water removed, lb. per kwh.	14.2
Power required per barrel of cement (593 lb. dry slurry), kwh.	13.9
Power required per ton of dry slurry, kwh.	47.0

Cost of electricity at $0.01 per kwh.:

Cost per barrel of cement	$0.139
Cost per ton of dry slurry	0.47
Cost per ton of water removed	1.41

The minimum rate for electric power in Seattle is 0.6 cent per kwh. when the consumer uses 500 hp. or more. This rate would reduce the cost per ton of water removed to $0.846 from $1.41.

McMinn[15] determined that the cost of coal in Seattle required to raise the temperature of water from 40 deg. F. and to evaporate it at 212 deg. F. was $0.706 per ton. It has been claimed that the dewatering costs of cement slurry can be reduced to $0.10 to $0.15 per ton of water by using the continuous, vacuum, filtering methods. Curtis[16] calculated the cost of dewatering with the above laboratory machine at $1.30 per ton, while it was estimated that with the efficiency obtained at Carlsbad, using the commercial kaolin, electrophoresis machines and power at $0.01 per kwh., the cost was between $0.65 and $0.80 per ton. Since plastic kaolins require more power for dewatering than cement slurry, it may be possible to reduce the costs developed with the experimental machine by the use of larger commercial equipment. A larger anode, heated by the electric current, will reduce the water content of the attached slurry cake by evaporation to a lower percentage than the 28.0 per cent reported above. The action is a combination of an electrophoresis machine and a rotating drum dryer. The latter, heated by steam, are in commercial use for drying ocher, whiting, and other nonmetallics.

---

[15] McMinn, B. T., Department of Mechanical Engineering, University of Washington.

[16] See footnote 4.

CONCLUSIONS

With the cement slurry tested, laboratory experiments on electrophoresis show that:

1. Limestone and clay both carry a negative charge and are deposited without apparent separation on the anode.
2. Cement slurry can be dewatered to some extent without the addition of an electrolyte, but the proper electrolytes will increase the fluidity, the rate of recovery, and the dryness of the deposit. A mixture of sodium carbonate and sodium silicate was found to be the most effective one in reducing the viscosity of this slurry for movement through the electrophoresis machine. Sodium silicate alone was found to increase the viscosity.
3. Increasing the cathode area by the use of a laminated cathode did not affect results.
4. The addition of Cottrell precipitate to the slurry changed the reaction with the electrolytes used, but did not materially affect the dewatering results when additional alkali was added to overcome the increased viscosity.
5. The estimated costs of electrical dewatering of cement slurry in Seattle are similar to those for the evaporation of water by burning coal and are probably higher than the dewatering costs reported for the continuous, vacuum filters.
6. Continued experiments should include the study of increased voltages above 110 and larger anodes to utilize the drum-drying effect of the attached cake.

Eastern Shippers Hopeful as Tendency on Price Is Firmer

A more hopeful feeling is generally expressed by cement men in New York, although the effect of foreign importations still exerts a malign influence on the Atlantic seaboard, according to the *Chicago Journal of Commerce* of May 11.

On the other hand, it was reported that optimistic reports of price firmness on cement in the East were not shared by producers in the Chicago building materials market at that time.

The eastern optimism goes on to say that producers who in the past practically disregarded the price factor in order to keep mills going at the highest possible capacity are now adhering to the current list quotations.

◆

Thousands Called Back to Work as Cement Plants Reopen

First of May Sees Reopening of Many Plants—Many Employ Full Force on 24-Hour Schedule

REPORTS of cement plants reopening the country over followed in rapid succession during the past month. Many are employing a normal working force. Others are operating on a part-time basis. Stocks have been depleted and operation for some months is anticipated by more than one plant.

The Lone Star Cement Co., Indiana, plant at Greencastle was one of those to resume under full steam on May 1. Two hundred men were called back to work for the first time since last fall.

Operations at the Independence, Kans., plant of Universal Atlas were resumed on May 1, but are to be limited until about July 1, when capacity production will be reached, according to C. M. Carman, superintendent. The Duluth plant of the same firm added one day weekly to its former working time of three days.

Work for 135 employees of the Medusa company at Bay Bridge, Ohio, idle since September, began the first of May.

The Arkansas Portland Cement Co. plant at Okay resumed operation on a 24-hour schedule on May 1, after having been idle for several months.

The Dewey plant at Bartlesville, Okla., closed since February 1, reopened May 10 at two-thirds capacity, employing approximately 250 men, while the North American mill at Howes Cave was scheduled to resume operation on June 1.

A reduction in wages was announced simultaneously with the reopening on May 1 of the Devil's Slide plant of the Union company by Robert Dorland, superintendent. More than 75 men were called back.

The Essexville, Mich., plant of the Aetna company has been operating with a normal employment of 125 men since late in April. How long the production schedule would be maintained was not known.

Other plants that were already in production prior to May 1, having reopened in April, included the Peerless mill at Port Huron, Mich., where 60 employees returned to work on the 12th, and the Hawkeye and Pennsylvania-Dixie plants in Iowa.

Hook-Up Between Mill and Separators Shown in Corrected Flow Sheet

Missouri Portland's Closed-Circuit Installation at Independence Incorrectly Shown in March Issue

The flow sheet showing the hook-up between a compeb mill and two air separators in the closed-circuit dry grinding installation at the Independence (Mo.) plant of the Missouri Portland Cement Co., illustrated on page 55 of the March issue of the Cement Mill Edition of CONCRETE, is incorrect, and may have been misleading to some readers.

As the flow sheet is shown, it gives the impression that all the tailings from the first separator go through the second and third compartments of the mill, after which the fines from the first separator, plus the discharge from the mill, are fed into two separators and the tailings are fed back into the third compartment, and the fines from the second and third separators go to the bins. This would be a possible method of operation, but it would require an extra separator and it would also require an equal division of the feed to the two separators, which would be difficult.

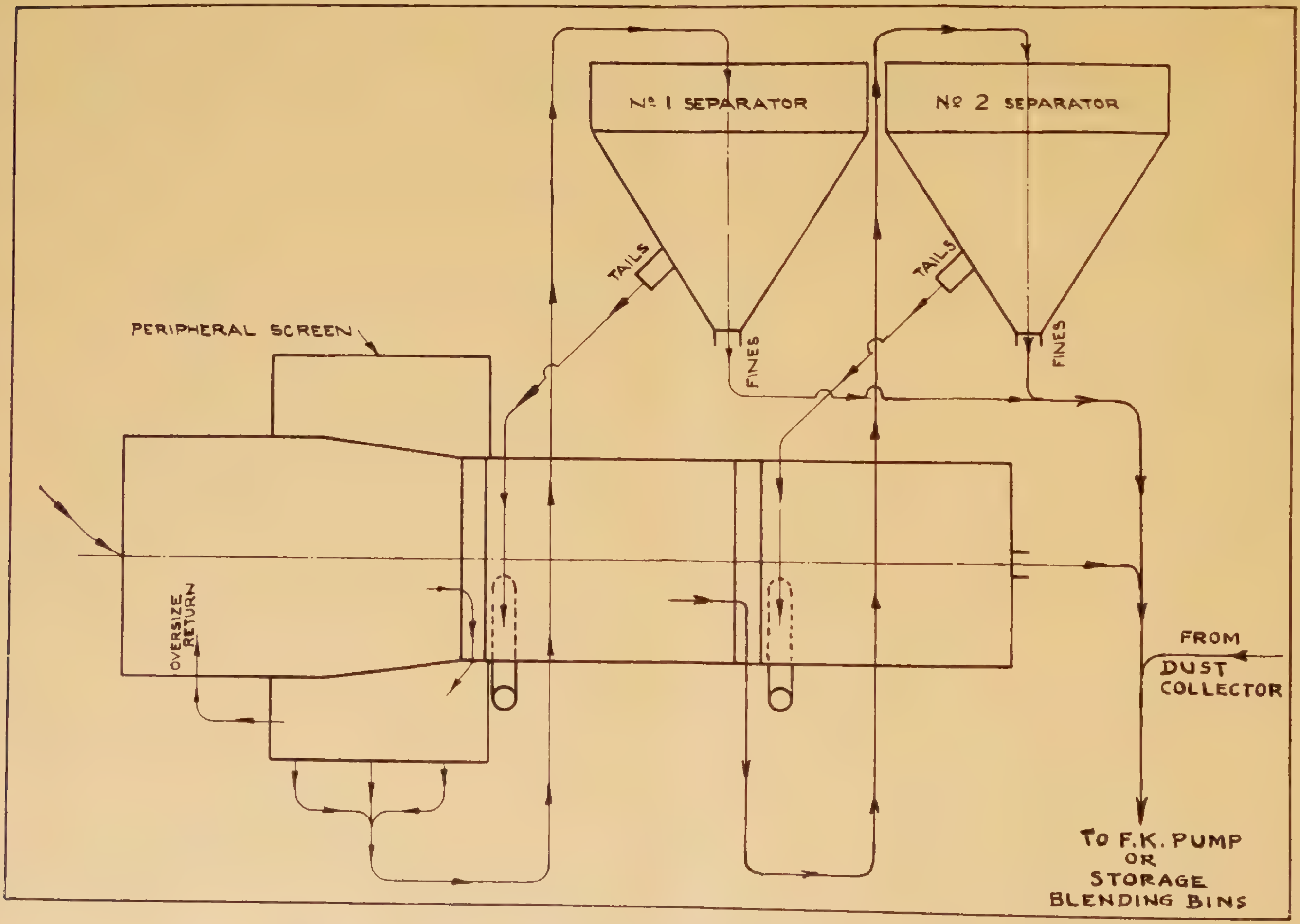
The corrected flow sheet, here illustrated, shows that the material discharging from the second mill compartment goes to the second separator, and the tailings from this second separator are returned to the third compartment, the fines being passed on to the Fuller-Kinyon pump. Provision is also made for returning the discharge from the third compartment either to the second air separator by means of the second elevator, or discharging into the Fuller-Kinyon pump where it will be mixed with the fines coming from the first and second air separators and the dust collector.

The compeb mill in this installation is a 3-compartment mill of Allis-Chalmers manufacture, 35 ft. long, with a diameter of 9 ft. 6 in. in the first compartment, and 8 ft. in the second and third compartments. The air separators are the 16-ft. size manufactured by the Raymond Brothers Impact Pulverizer Co.

Federal Commission Eyes Cement Trade Associations

An investigation is being made by the Federal Trade Commission of competitive conditions in the cement industry involving an inquiry as to whether activities of trade associations of manufacturers of cement or dealers constitute violations of the anti-trust laws.

In addition to the field work, which is almost completed, information has been received through questionnaire letters addressed to manufacturers, state highway commissions, dealers, contractors, and ready-mixed concrete companies. Considerable progress has been made in classifying and assembling the information in the files, with a view to preparing a report.



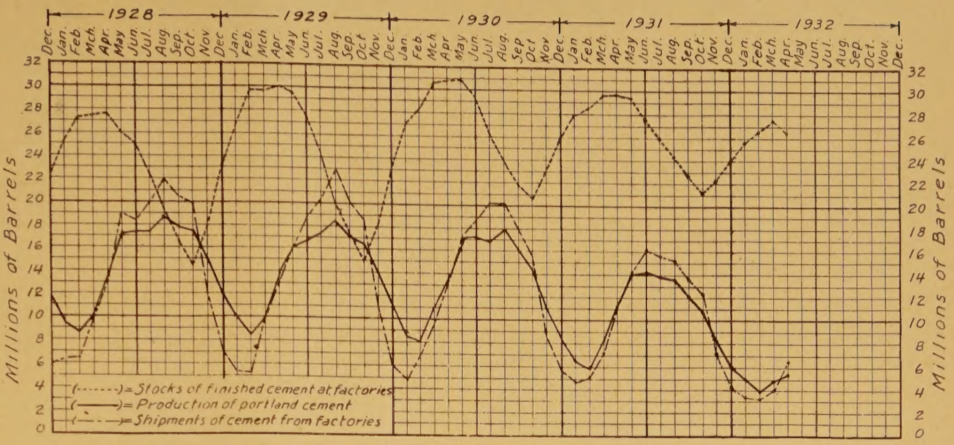
Flow sheet showing the closed-circuit hook-up between a compeb mill and two air separators at the Independence plant of the Missouri Portland Cement Co.

Cement Statistics for April

Month's Production Placed at 5,478,000 Barrels

Relation of Production to Capacity

	The Month	The Twelve Months
April, 1932	24.8	41.7
April, 1931	52.1	57.7
March, 1932	21.3	43.8
February, 1932	18.7	45.2
January, 1932	22.0	45.9



	1931	1932	Increase or Decrease, %
Production, April	**11,245,000**	5,478,000	—51.3
Shipments, April	**11,184,000**	6,536,000	—41.6
Stocks at end of month	**29,715,000**	26,487,000	—10.9

	1931	1932	Increase or Decrease, %
Total production for yr.	**32,005,000**	19,322,000	—39.6
Total shipments for yr.	**28,142,000**	17,020,000	—39.5
No. of plants reporting	165	165	

Production, Shipments, and Stocks of Finished Portland Cement, by Districts, in April, 1931 and 1932, and Stocks in March, 1932 (In Barrels)

District	Production—April 1931	Production—April 1932	Shipments—April 1931	Shipments—April 1932	Stocks at end of month 1931	Stocks at end of month 1932	Stocks at end of March, 1932*
Eastern Pa., N. J. and Md.	**2,691,000**	1,497,000	**2,587,000**	1,720,000	**6,725,000**	6,014,000	6,237,000
New York and Maine	**832,000**	537,000	**769,000**	522,000	**2,076,000**	1,924,000	1,909,000
Ohio, Western Pa. and W. Va.	**829,000**	309,000	**919,000**	520,000	**3,476,000**	3,190,000	3,401,000
Michigan	**524,000**	290,000	**529,000**	259,000	**2,586,000**	2,045,000	2,015,000
Wis., Ill., Ind. and Ky.	**1,231,000**	564,000	**1,260,000**	611,000	**4,208,000**	3,772,000	3,818,000
Va., Tenn., Ala., Ga., Fla. and La.	**1,268,000**	484,000	**1,343,000**	537,000	**1,639,000**	1,548,000	1,601,000
Eastern Mo., Ia., Minn. and S. Dak.	**1,261,000**	420,000	**1,029,000**	591,000	**4,064,000**	3,636,000	3,808,000
W. Mo., Nebr., Kans., Okla. and Ark.	**674,000**	83,000	**942,000**	505,000	**1,885,000**	1,483,000	1,905,000
Texas	**585,000**	397,000	**581,000**	368,000	777,000	**800,000**	771,000
Colo., Mont., Utah, Wyo. and Idaho	**233,000**	93,000	**184,000**	126,000	**600,000**	398,000	431,000
California	**793,000**	535,000	**733,000**	554,000	**1,110,000**	1,072,000	1,091,000
Oregon and Washington	**324,000**	269,000	**308,000**	223,000	569,000	**605,000**	558,000
	11,245,000	5,478,000	**11,184,000**	6,536,000	**29,715,000**	26,487,000	27,545,000

Production, Shipments, and Stocks of Finished Portland Cement, by Months, in 1931 and 1932 (In Barrels)

Month	—Production— 1931	—Production— 1932	—Shipments— 1931	—Shipments— 1932	Stocks at end of month 1931	Stocks at end of month 1932
January	**6,595,000**	5,026,000	**4,692,000**	3,393,000	**27,759,000**	25,778,000
February	**5,920,000**	3,971,000	**5,074,000**	3,118,000	**28,612,000**	26,657,000
March	**8,245,000**	4,847,000	**7,192,000**	3,973,000	**29,676,000**	*27,545,000
April	**11,245,000**	5,478,000	**11,184,000**	6,536,000	**29,715,000**	26,487,000
May	14,010,000	....	14,200,000	....	29,554,000	....
June	14,118,000	....	16,077,000	....	27,602,000	....
July	13,899,000	....	15,545,000	....	25,934,000	....
August	13,549,000	....	15,172,000	....	24,313,000	....
September	12,092,000	....	13,671,000	....	22,736,000	....
October	10,762,000	....	12,360,000	....	21,218,000	....
November	8,161,000	....	7,156,000	....	22,219,000	....
December	5,974,000	....	4,142,000	....	24,098,000	....
	124,570,000	....	126,465,000	....	....	....

---

*Revised.

Blacker type indicates larger of two figures.

MEN and MILLS [News of and for Cement Mill Men]

A clearing-house page for all kinds of local cement mill news—to promote the comradeship and mutuality of interest that exists among those who make portland cement.

Readers in all mills, even though not regular contributors, are invited to send in news notes about personal and plant activities that may be of interest or value to the men in other mills.

Col. E. M. Young Passes Away Following Illness

Colonel Edward Mark Young

The death of Colonel Edward Mark Young occurred at Allentown, Pa., on the evening of April 26, after an illness of several months. Col. Young was the president and one of the founders of the Lehigh Portland Cement Co., a leader in safety work, and had served the Portland Cement Association in several official capacities. Col. Young was also president of the Lehigh Valley Trust Co., of Allentown; president of the Allentown Steam Heat and Power Co., vice-president of the Lehigh Valley Transit Co., and a director in the Canada Cement Co., the Great Lakes Portland Cement Corp., the Pennsylvania Power & Light Co., the Lehigh Power Securities Co., and the Donaldson Iron Co.

It was largely through Col. Young's foresight that the Lehigh company was among the first to recognize the possibilities of the cement industry extending beyond the original field in the Lehigh Valley.

Edward Mark Young was born in Allentown on September 24th, 1866. After attending the public schools and Muhlenberg College, he began his business career in the firm of M. S. Young & Company, hardware merchants. This business, established by Col. Young's grandfather in 1843, remains one of Allentown's leading enterprises. In the fall of 1897 a group of Allentown business men, including Col. Young and General Harry C. Trexler, organized the Lehigh Portland Cement Co., of which Col. Young was, at the time of his death, president and of which Gen. Trexler is still chairman of the board.

Although a leader in the Republican party in Pennsylvania, the only position he ever sought was that of delegate to the Republican national convention. He served a number of times in that capacity, as had his father and grandfather before him. Community activities made a claim to his services and he was a leader in many civic movements.

Fire Causes $60,000 Loss at Plant of Consolidated Cement

Fire starting shortly after 9 a. m. on May 3 destroyed the packing house and one section of the storage quarters of the Consolidated Cement Corporation's plant at Cement City, Mich., causing a loss of between $60,000 and $70,000.

Firemen and equipment from the nearby towns of Jackson, Addison and Adrian prevented the blaze from spreading to the main section of the plant and to eight large storage elevators. The cause of the fire has not been determined.

The fire started in the sacking department of the packing house and spread rapidly through more than 550,000 cloth and paper sacks. Fanned by a brisk wind, it threatened to jump across railroad sidings to the plant.

About 17 men are working in the plant at present, the main portion of the plant not being in operation.

Blank Asks Judgment for Mortar Commission

John A. Blank, of Ironton, Ohio, former general superintendent of the Superior, Ohio, cement plant of the Wellston Iron Furnace Co., has filed suit in the Lawrence county court of common pleas asking judgment of $6,000 against the Wellston company.

The judgment is alleged to be due as commission on Wifco, a colored mortar, produced under a formula said to have been compiled by Blank.

Wheaton Tells Kansans of Work and Life in Buenos Aires

Howard Wheaton, on furlough from Buenos Aires, where he is manager of the International plant there, spoke informally before a joint dinner meeting of the Iola, Kansas, Rotary Club and Chamber of Commerce on April 14.

He began by describing the journey from New York to South America. The boat, he said, required 18 days to make the journey, although about two days are lost in stops en route. The actual distance is about 6,600 miles.

The rail system in the Argentine compares favorably with our own, the speaker said, except for the matter of mileage. Much of the country is still unconnected with rail transportation.

Buenos Aires itself is a modern, progressive city, the speaker said. The people are predominantly Latin in temperament and appearance. An interesting sidelight on the customs there was brought out when Mr. Wheaton said that until a very few years ago, the native men never wore Palm Beach clothes in the summer no matter what the temperature. It remained for an aggressive American merchant to popularize the habit of wearing light clothing in summer, and now it is widely followed.

Temm Suffers Injury from Transformer Flash

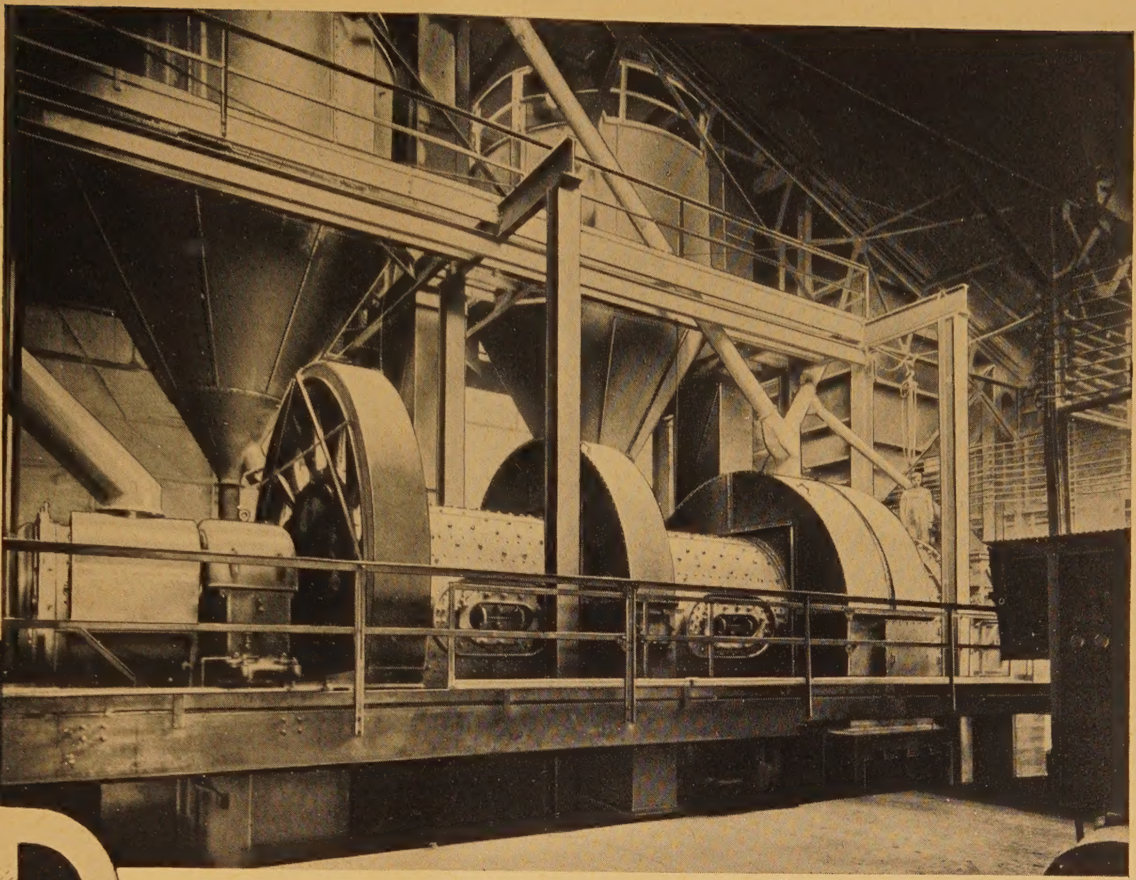
Joseph W. Temm, chief electrician at the Alpha plant at La Salle, Ill., was seriously burned by a flash from a transformer on April 26.

He was alone in the transformer room of the power house when struck in the face and hands. The right side of his head and both hands were burned.

Although suffering from burns and shock, Temm managed to pull the power switch. After receiving first aid he was taken to the hospital.

Signal Mountain Chemist Addresses Engineers

S. Rordam, chief chemist of the Signal Mountain Portland Cement Co., spoke on the subject of cement at a luncheon of the Chattanooga (Tenn.) Engineers' Club on May 16.



Progressive Grinding...

... used only in Allis-Chalmers Compeb Mills, equipped with air classifiers, satisfies the most exacting requirements of present day cement manufacturers. One mill so equipped, will replace several preliminary and finishing mills.

Progressive Grinding results in low power consumption and permits a wide range of fineness control, including the requirements of high early strength cement.

The saving in power, attendance and operating expense resulting from **Progressive Grinding** is possible only through the use of Allis-Chalmers Compeb Mills. Only **Compeb Mills** embody all of the features of design and construction necessary for **Progressive Grinding.**

Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

ALLIS-CHALMERS

This advertisement is to help you get ready for better business

Worn Jaw Crusher Plates Rebuilt by Welding

Either Oxy-Acetylene or Electric Arc Process Employed With Welding Rods of Chromium-Manganese-Iron Alloy

In these days when the saving of a dollar is studied from all angles, industries are looking over their equipment with the idea of reclaiming much of that which was formerly replaced when it was worn out.

Abrasion is always the enemy of machinery of all types. When steel clashes on steel, or dust interferes with good lubrication, or earth and stone grind away metal parts, then some piece of apparatus will show a decrease in life. Many plant managements are inspecting their equipment with an eye to salvaging a vast amount of material by rebuilding and hard-facing.

Worn Jaw Crusher Plates Reclaimed

One steel mill in the Middle West found that it was possible to reclaim worn jaw-crusher plates by this process at a considerable saving. These plates had worn away and required replacing or repair. The company rebuilt the plates in the manner shown in the accompanying illustration.

The plate undergoing repair was supported in a horizontal position, and a salamander was used during the building-up process for preheating the part in order to prevent cracking. The worn ribs were then built up one layer at a time with hascrome welding rod until a thickness of ¼ in. had been obtained. By applying the hascrome in this manner more even distribution of heat was obtained, producing a good bond with the base metal and a minimum amount of warpage.

Jaw crusher plates are preheated from below with salamanders before being built up with welding alloy

The hard-faced crusher is still in operation, so that it is impossible to give the actual figures on cost and service life. However, when last inspected the jaws were giving excellent service. A uniformly crushed product was being obtained, and the crusher was cleaning itself.

This method of salvaging worn crusher plates was found to be economical because the saving resulting from decrease in time lost and increase in life was greater than the expense of rebuilding. The welding material used is a self-hardening chromium-manganese-iron alloy, supplied in the form of welding rod, and may be applied by either the oxy-acetylene or the electric arc process. Where large castings are to be rebuilt, as in the case of crusher plates, the electric arc process is preferable because there is less danger of cracking or warping the piece.

About the Manufacturers

Industrial Literature

New Raymond Catalog

Handling Materials by Air is the title of a new catalog prepared by *Raymond Bros. Impact Pulverizer Co.*, Chicago.

Contents include data on mechanical air separators, vacuum air separating plants, dust collecting systems, special operations, typical installations, and a list of products.

De-ion Circuit Breaker Publication

The Westinghouse Electric and Manufacturing Co., E. Pittsburgh, Pa., announces two 8-page, illustrated circulars on its new line of *De-ion* circuit breakers. These breakers use a new method of arc extinction that enables elimination of all fuses in panelboards, distribution switchboards within the breaker's capacity and industrial applications where fused safety switches are now used.

Circular 1939 contains a general description of the new breakers, breaker ratings, and their applications. *Circular 1937* gives construction and application details of the 225-ampere breaker.

Field Activities

Farval Lubrication System

The Farval Corporation, Cleveland, Ohio, has recently acquired the manufacturing and sales rights of the Farval centralized system of lubrication. This equipment was formerly manufactured by Lubrication Devices, Inc., Battle Creek, Mich. The officials of the company include Howard Dingle, president; W. W. Clark, vice-president; H. C. Robinson, treasurer; A. C. Blair, secretary. A. J. Jennings, formerly vice-president of Lubrication Devices, Inc., is general sales manager of the Farval Corporation.

The general sales and manufacturing facilities for the Farval lubrication system are now located at the Cleveland, Ohio, address. Distribution of Farval equipment for the central industrial section of the country is being handled by the Dingle-Clark Company, with offices in Cleveland, Cincinnati, Pittsburgh and Philadelphia.

The Farval system provides the positive delivery at high pressure of a measured quantity of any type of lubricant to any number of bearings from one central pumping station, it is stated.

Cheyette Traylor Chicago Manager

The Chicago office of the *Traylor Engineering & Manufacturing Co.*, is now located in the One La Salle Street Building. *Benard Haislip*, former district manager, has resigned and is succeeded by *D. A. Cheyette*, formerly assistant district manager of the New York office.